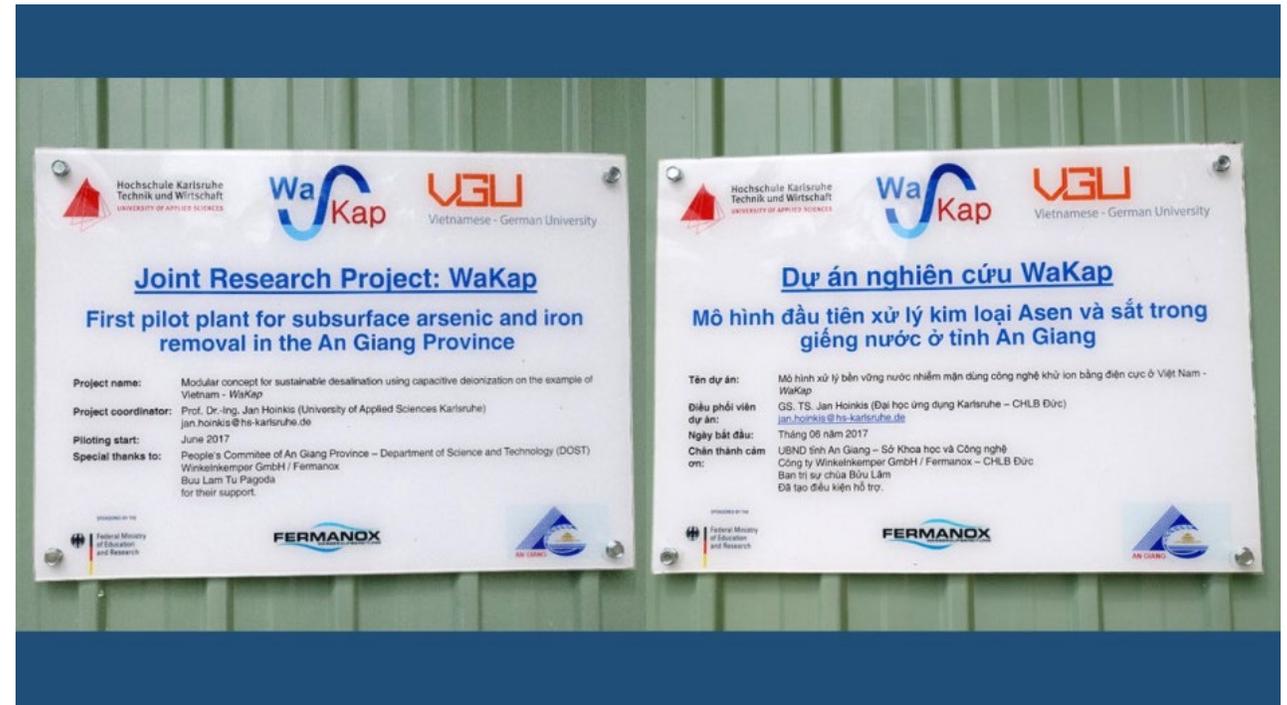


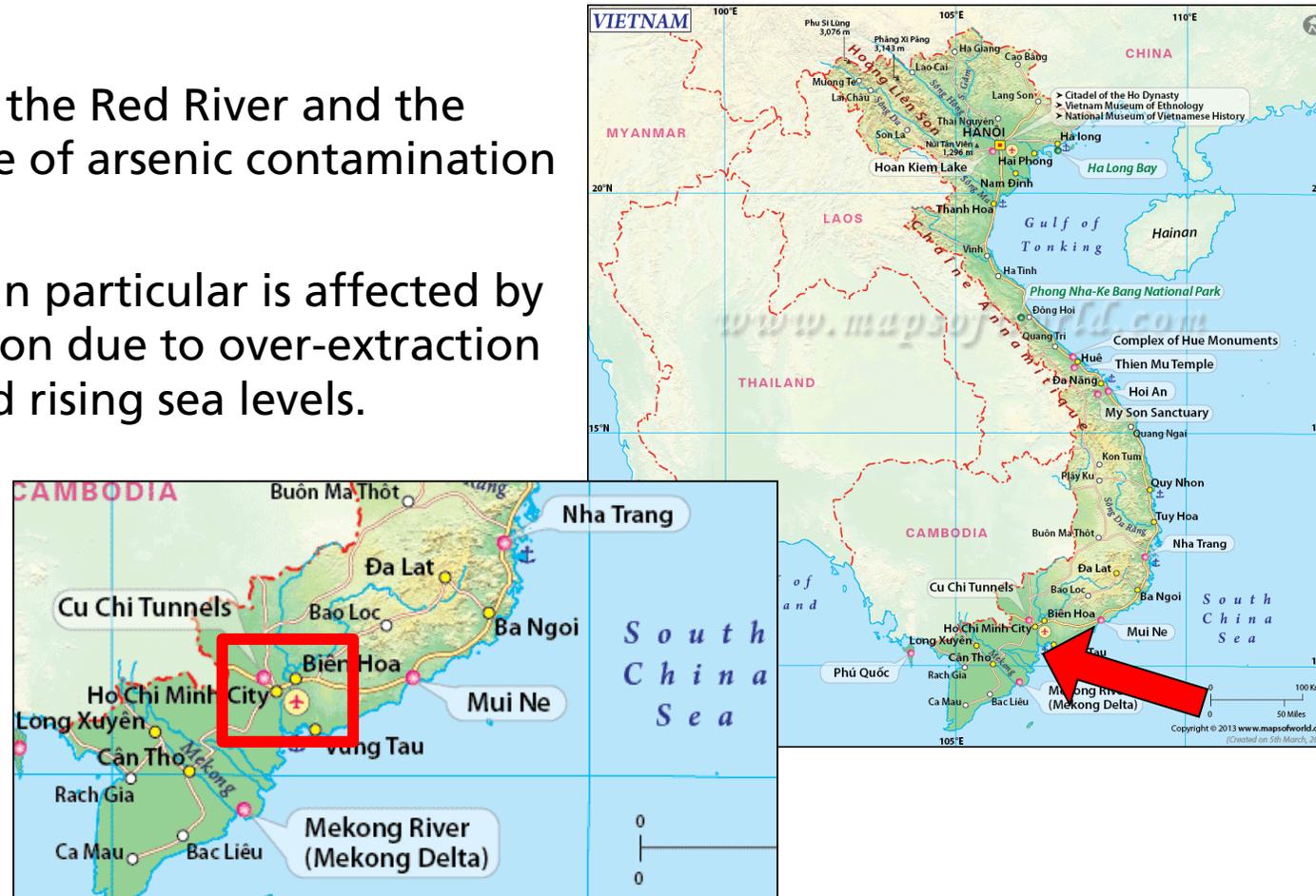
SUSTAINABLE BUSINESS MODELS FOR DECENTRALIZED WATER TREATMENT

Findings from WaKap - Modular concept for sustainable desalination using capacitive deionization on the example of Viet Nam



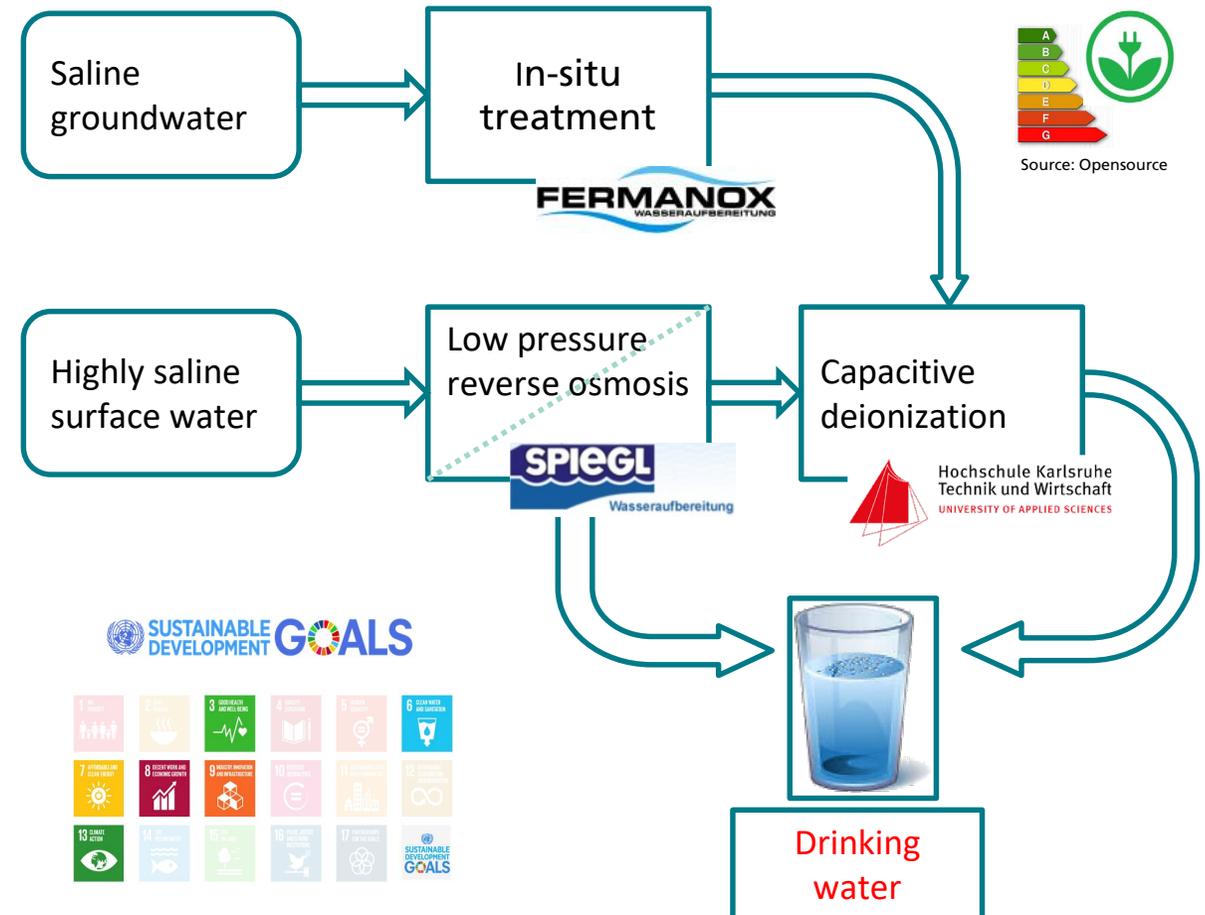
Selection of pilot regions to target challenges with arsenic contamination and salinization in the southern part of Viet Nam

- In the delta area of the Red River and the Mekong, occurrence of arsenic contamination of groundwater.
- The Mekong Delta in particular is affected by increasing salinization due to over-extraction of groundwater and rising sea levels.



WaKap-approach to overcome challenges with arsenic contamination and salinization in the southern part of Viet Nam

- Development of modular and sustainable energy-efficient processes for water desalination and arsenic removal.
- Energy supply through renewable energies (wind, solar)
- Sustainability assessment with regard to environmental, economic and social aspects
- Framework conditions to design sustainable business models for decentralized water treatment technologies in Viet Nam for international technology providers



Sustainability assessment with regard to environmental, economic and social aspects

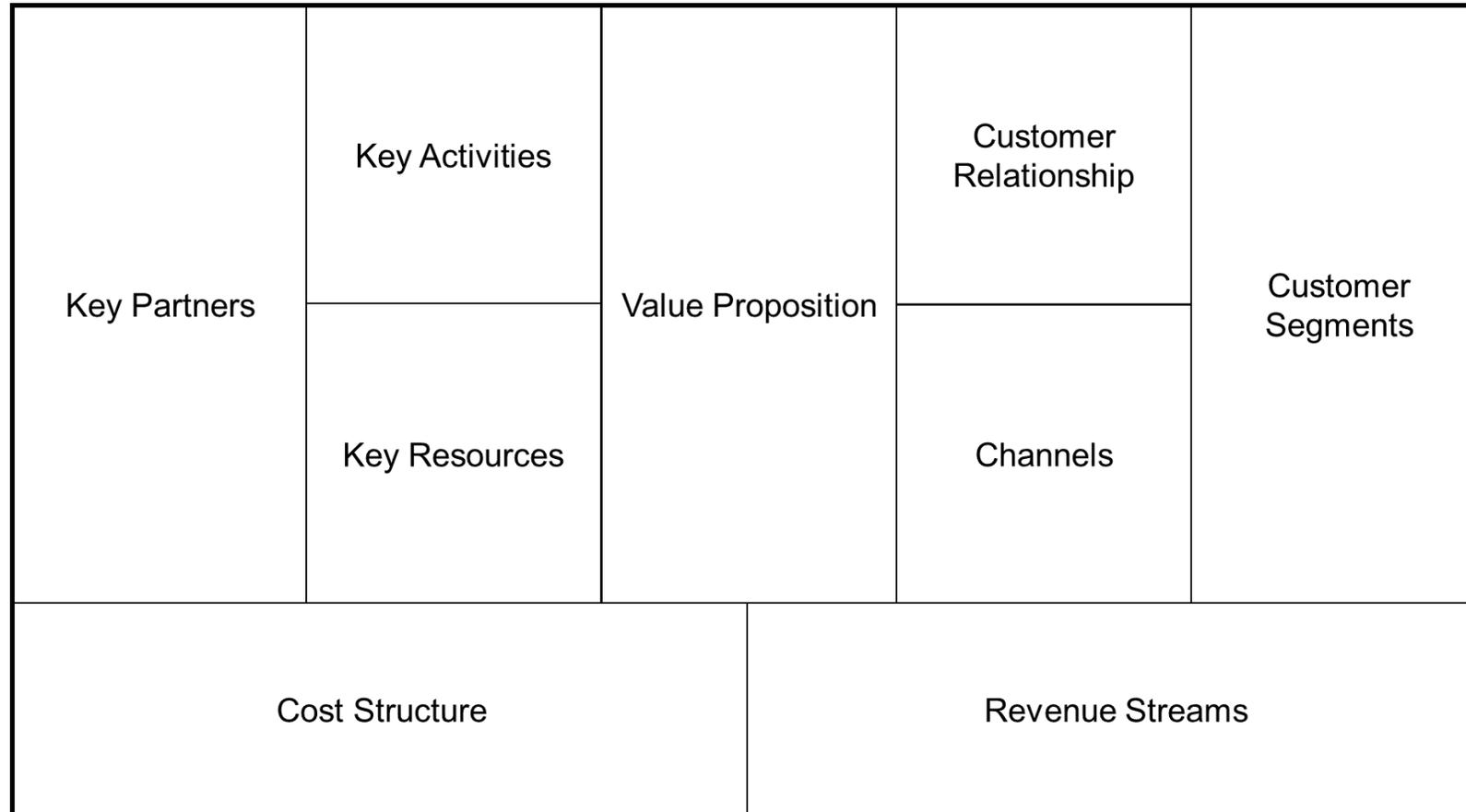
Environmental criteria	Safety-relevant criteria	Economic criteria	Social criteria	Technical criteria
Greenhouse gas emission	Germ infestation/hygiene	(Net) costs	Convenience	Treated water quantity
Resource use	Smell/turbidity	Operating and maintenance costs	Economic burden	Flexibility w.r.t. changing conditions
Energy efficiency	Ecotoxic substances (in water)	Flexibility, system's readiness for change	Nuisance	Dependency from other infrastructure
Land use		Profitability (project economics) →	Social legitimacy and public acceptability	Durability and possibilities of maintenance
Waste generation		Employment (economic effects) →	Effects on land and resource use	Vulnerability to failure
Water footprint			Society and consumer: political legitimacy	Security of supply; effect of system failure
			Society and consumer: affordability	Security of technology
			Equity between socio-economic groups →	
			Participation, technology transfer	

Framework conditions to design sustainable business models

- Identify framework conditions for sustainable business models (SBM) that provide access to safe drinking water for low- and middle-income populations in Viet Nam using decentralized water treatment technologies.
- SBMs are understood as contributing to society and/or ecology by striving for sustainable social, ecological, and economical values and considering (negative) externalities.
- Provide market information on Vietnamese low- and middle-income market for European technology providers

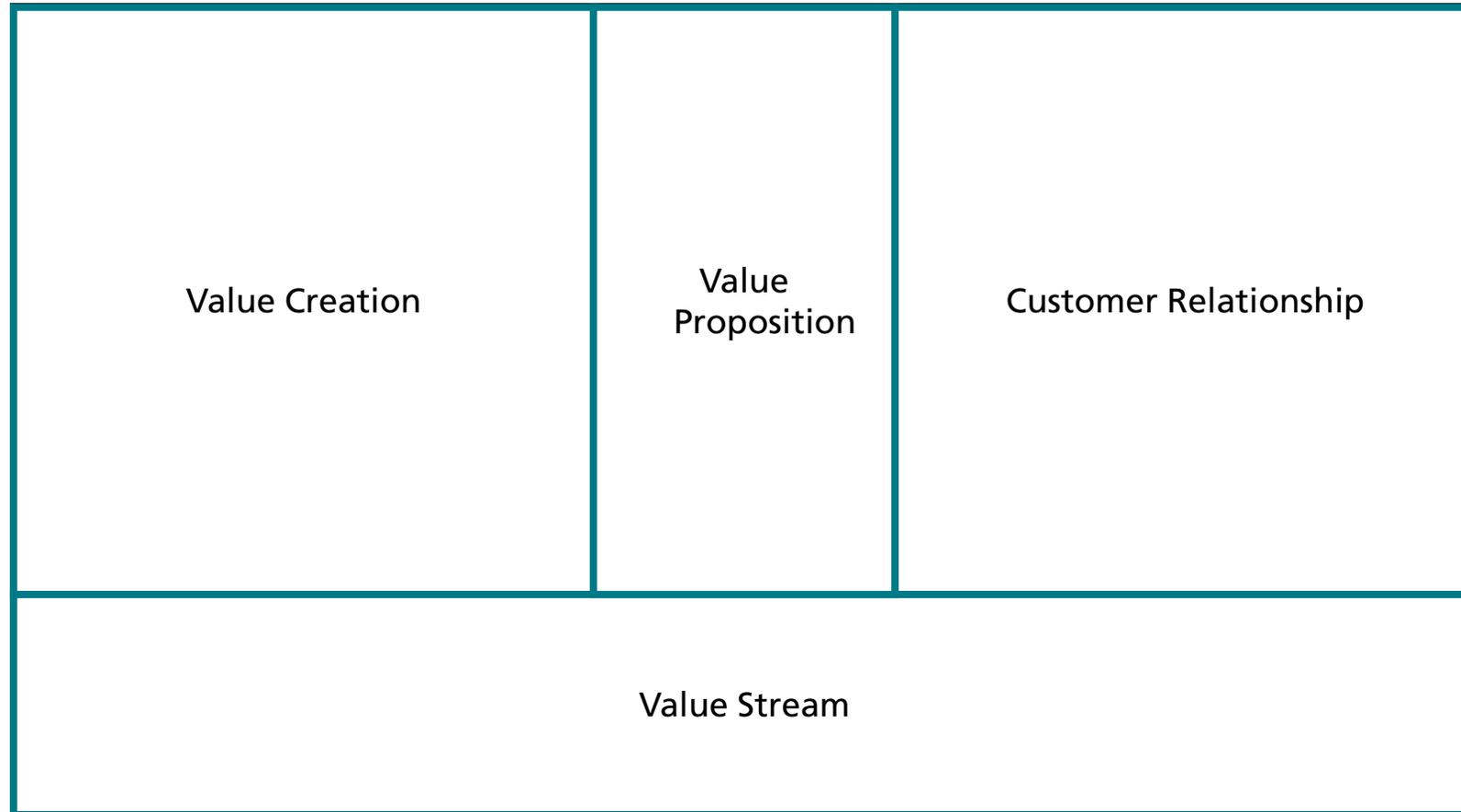
Fritz et al. (2020)

Definition of the term ,business model'



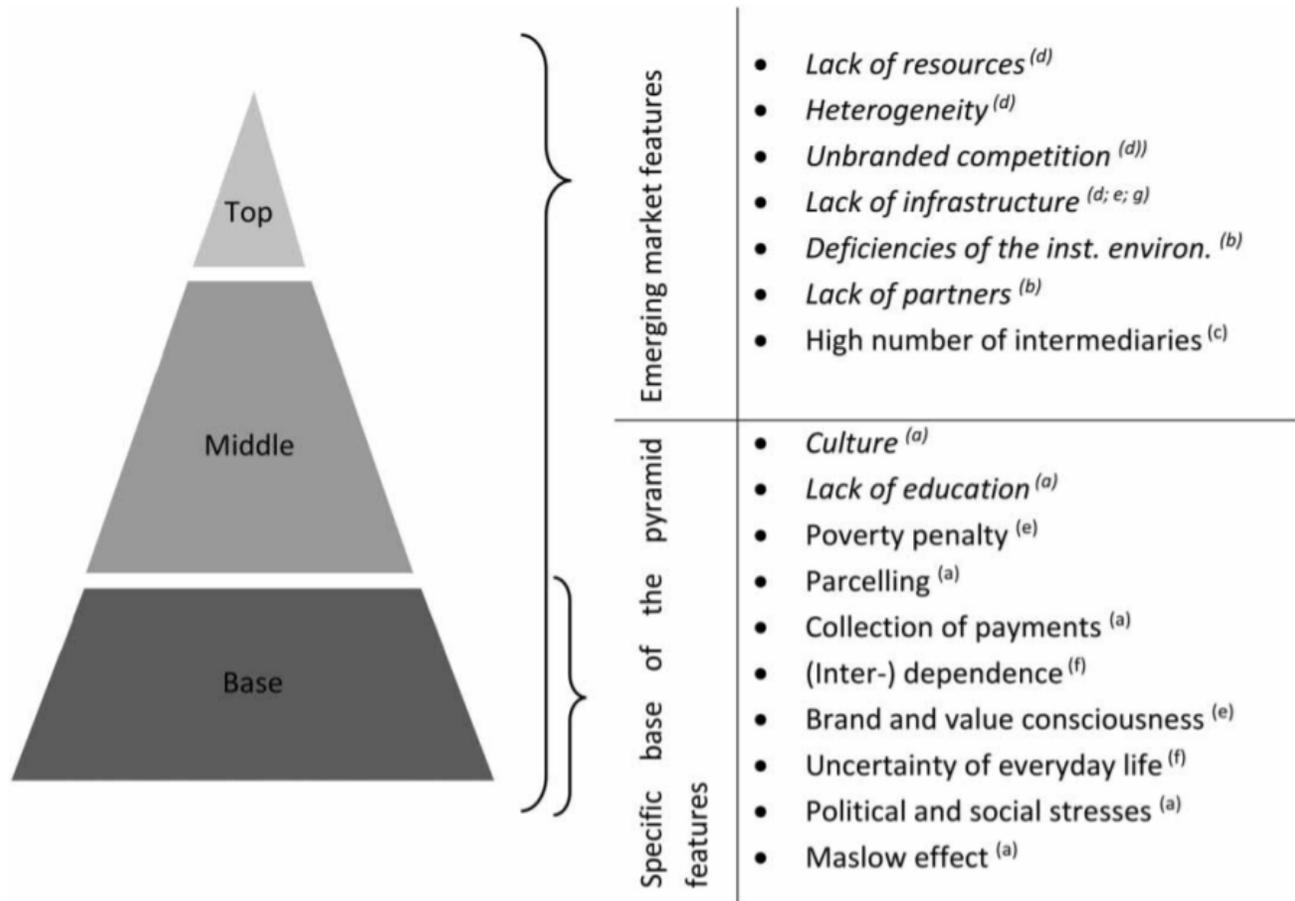
Osterwalder and Pigneur (2010)

Definition of the term ,business model'



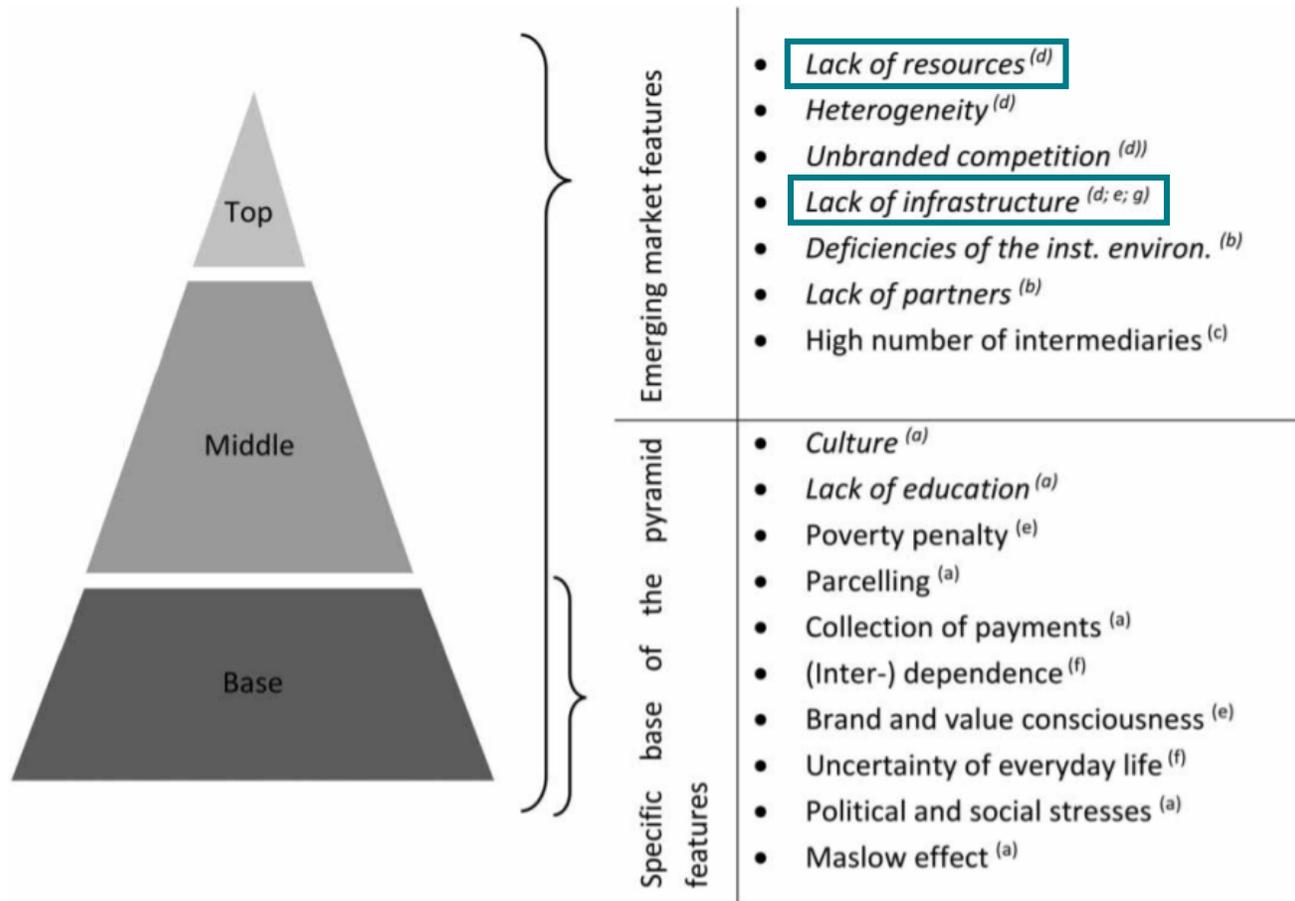
Osterwalder and Pigneur (2010)

Features of emerging markets and the BoP and potential BM responses



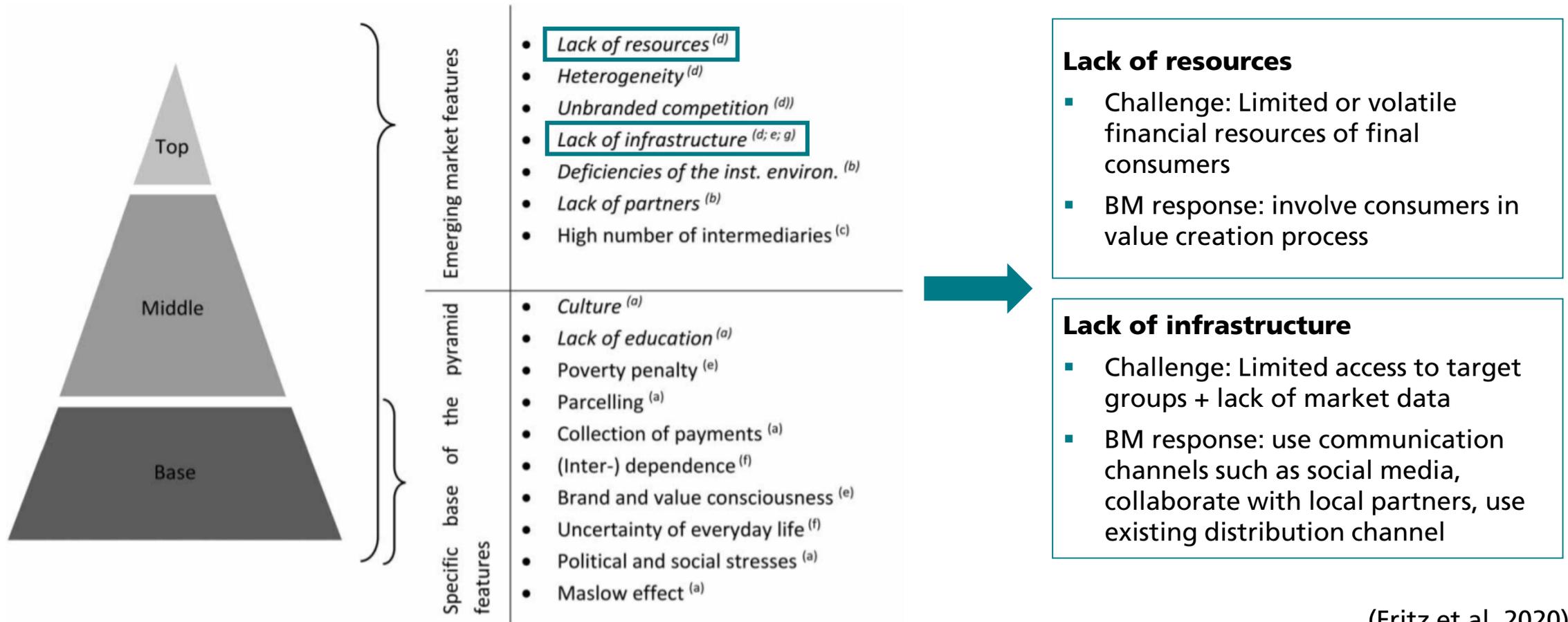
(Fritz et al. 2020)

Features of emerging markets and the BoP and potential BM responses



(Fritz et al. 2020)

Features of emerging markets and the BoP and potential BM responses



(Fritz et al. 2020)

Conclusion

- The provision of clean drinking water can be interpreted as a public service and thus as part of the general interest. For sustainability assessment of drinking water treatment plants, social aspects play an outstanding role, in addition to ecological, safety-relevant, economic and technical aspects.
- To ensure access to safe drinking water for low- and middle-income populations in Vietnam via decentralized technologies, (European) technology providers need to consider the local framework and respond with tailored SBMs.
- Collaboration and partnerships with local partners, e.g. retailers or final customers, are seen as important success factors in this respect.

Thank you for your attention!

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- Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. New York: John Wiley & Sons.

For further information on the WaKap project, see e.g.:

- Cañas Kurz, Edgardo E.; Luong, Vu T.; Hellriegel, Ulrich; Leidinger, Felix; Luu, Tran L.; Bundschuh, Jochen; Hoinkis, Jan (2020): Iron-based subsurface arsenic removal (SAR): Results of a long-term pilot-scale test in Vietnam. In: *Water research* 181, S. 115929. DOI: 10.1016/j.watres.2020.115929.
- Hellriegel, U.; Cañas Kurz, E. E.; Luong, T. V.; Bundschuh, J.; Hoinkis, J. (2020): Modular treatment of arsenic-laden brackish groundwater using solar-powered subsurface arsenic removal (SAR) and membrane capacitive deionization (MCDI) in Vietnam. In: *Journal of Water Reuse and Desalination* 10 (4), S. 513-526. DOI: 10.2166/wrd.2020.031.
- Luong, Vu T.; Cañas Kurz, Edgardo E.; Hellriegel, Ulrich; Luu, Tran L.; Hoinkis, Jan; Bundschuh, Jochen (2018): Iron-based subsurface arsenic removal technologies by aeration: A review of the current state and future prospects. In: *Water research* 133, S. 110-122. DOI: 10.1016/j.watres.2018.01.007.